



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/804,513	03/19/2004	Peng Zhang	06293P3 USA	7652
23543 7590 01/22/2008 AIR PRODUCTS AND CHEMICALS, INC. PATENT DEPARTMENT 7201 HAMILTON BOULEVARD ALLENTOWN, PA 181951501			EXAMINER WEBB, GREGORY E	
			ART UNIT 1796	PAPER NUMBER
			MAIL DATE 01/22/2008	DELIVERY MODE PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary

Application No.

10/804,513

Applicant(s)

ZHANG ET AL.

Examiner

Gregory E. Webb

Art Unit

1796

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _____ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on _____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) _____ is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) _____ is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

1/14/08

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

2. Claims 17, 18, 20-25, 28-29, 32, 35-38, 40-43, and 45-53 are rejected under 35 U.S.C. 102(b) as being anticipated by Haq (US 4,744,834).

Art Unit: 1796

3. Haq teaches photoresist stripping composition containing 10-90% pyrrolidinonen, 10-30 glycol ether, 1-10% poly glycol and 0.5-4% of a quaternary ammonium hydroxide (according to formula VI).

4. Concerning the ammonium hydroxide, Haq teaches the following:

wherein R.sub.3 and R.sub.4 are the same or different alkyl groups of 1 to 4 carbon atoms, R.sub.5 an alkyl group of 1 to 18 carbon atoms, and R.sub.6 is an alkyl group of 1 to 18 carbon atoms, phenyl, alkylphenyl wherein the alkyl is of 1 to 18 carbon atoms, benzyl, or alkylbenzyl wherein the alkyl is of 1 to 18 carbon atoms. The composition of the present invention must include 0.5% to 4% by weight, more preferably 1% to 2% by weight, and most preferably about 1.2% by weight of the quaternary ammonium hydroxide. Specific examples of quaternary ammonium hydroxides include tetramethyl ammonium hydroxide, tetraethyl ammonium hydroxide, **benzyl trimethyl ammonium hydroxide, phenyl trimethyl ammonium hydroxide, dodecyl trimethyl ammonium hydroxide, hexadecyl trimethyl ammonium hydroxide, octadecyl trimethyl ammonium hydroxide**, dodecyl triethyl ammonium hydroxide, hexadecyl triethyl ammonium hydroxide, octadecyl triethyl ammonium hydroxide, dodecyl tri-n-propyl ammonium hydroxide, docecyl tri-isopropyl ammonium hydroxide, benzyl dimethyl hexadecyl ammonium hydroxide, dimethyl ethyl hexadecyl ammonium hydroxide, **p-dodecylbenzyl trimethyl ammonium hydroxide** and benzyl dimethyl octadecyl ammonium hydroxide. (*emphasis added*)

5. Claims 17, 18, 20-25, 28-29, 32, 35-38, 40-43, and 45-53 are rejected under 35 U.S.C. 102(b) as being anticipated by Sachdev (US 20020000239).

6. Sachdev teaches a method for removing cured resins from an electronic device. Sachdev teaches the use of quaternary ammonium hydroxide as well as solvents such as the glycol ethers and pyrrolidones (see claims 4, 10 and 11).

7. Sachdev teaches representative quaternary compounds including benzyl trimethyl ammonium hydroxide (see par 60).

8. Claims 17, 18, 20-25, 28-29, 32, 35-38, 40-43, and 45-53 are rejected under 35 U.S.C. 102(b) as being anticipated by Moore, John C. (US20040074519).

Art Unit: 1796

Concerning the semiconductor devices, Moore, John C. teaches the following:

[0028] In employing the stripping solutions of this invention, the substrate covered with the baked **photoresist** is brought into contact with the stripping solution at a temperature of .gtoreq.70.degree. C.; additional heating will improve performance and loading capacity. Times required for stripping the **photoresist** vary to quite an extent depending on the specific polymer used in the **photoresist**, the **photoresist** curing prefacing conditions, temperature of the stripper, and agitation of the medium, varying from no agitation (static) to a maximum agitated solution resulting from ultrasonic cavitation action. Generally, the time involved will be less than 10 minutes and during optimized performance conditions, may be measured in seconds, while some **photoresist**, depending on the baked temperature, may require times of more than 10 minutes and up to 30 to 60 minutes, where lower processing temperatures of the invention stripper are employed on highly polymerized and metallized surfaces. It will be appreciated that many **photoresists** are completely dissolved from the substrate while others may be loosened, and floated off, and then subsequently dissolved in the stripping composition. Examples of the kind of **photoresists** which may be stripped by the composition of the present invention are shown in Table I: *(emphasis added)*

Concerning the rinsing, aqueous solvent and the preferred solvents, Moore, John C. teaches the following:

[0030] After the photoresist has been stripped from the **substrate**, the **substrate** may then be **rinsed** in water, or in an alcohol such as isopropanol or other hydrophilic and compatible solvents, e.g. **NMP**, **DMPD**, **EG**, or mixtures thereof; other compatible **rinsing** solvents well known to one of ordinary skill in the art may also be used. *(emphasis added)*

Concerning the deionized water, Moore, John C. teaches the following:

[0023] For dissolution and removal of LCP, polyimide, and thick film acrylic resists, the temperature employed for suitable performance is important. Generally, in any polymer removal application, an elevated temperature above about 70.degree. C. is preferred. Although some systems will vary, it is preferred that the dissolution and removal of full-cure LCP and polyimide be conducted at a temperature in the range of about 120.degree. C. to about 130.degree. C. for at least about 20 minutes. Thick film acrylic resists which have been fully-cured and exposed to temperatures of 200.degree. C. are dissolved and removed in most cases within about 5 minutes using a processing temperature of about 80.degree. to 90.degree. C. In all removal applications **deionized water** is recommended for rinsing. *(emphasis added)*

Art Unit: 1796

Concerning the non-aqueous solvent, Moore, John C. teaches the following:

[0017] The solvent system comprises a cyclic ketone e.g., N-methylpyrrolidone (NMP), Dimethylpiperidone (DMPD), etc. The ketone solvent is employed in amounts from 50 to about 87.5 weight percent and preferably in proportions of about 60 to about 75 weight percent. Other common photoresist solvent families such as amides, aldehydes and certain ketones not mentioned here such as **acetone** and methylethylketone (**MEK**) are not stable with BTMAH. Due to the alkaline nature of BTMAH, these solvents tend to react with BTMAH via Hoffman Degradation (amides) and Reductive Amination (aldehydes and certain ketones) to reduce the hydroxide to trimethylamine, neutralize the system, cause a color change i.e. slight yellow to dark brown, which may adversely affect performance. For this reason, certain solvents are avoided to come into contact with BTMAH and therefore are not considered for these compositions. (*emphasis added*)

Concerning the methanol, Moore, John C. teaches the following:

[0016] The BTMAH content may vary from about 3 to about 15 weight percent and preferably comprise about 4 to about 8 weight percent of the stripper. BTMAH is an organic solid and is commonly made available in lower alcohols, e.g. **methanol**, or water. In the invention, the BTMAH is prepared in a stock solution of ethylene glycol (EG). Stock concentrations of BTMAH in EG can run near 50% by weight as BTMAH. To ensure this stock solution of a strong caustic (BTMAH) and EG is stable over time, a stabilizer is added. The preferred stabilizer is paraformaldehyde (PF). The concentration of PF in the final solution (invention mixture) ranges from 300 to 10,000 ppm (1%) and is preferred to be approximately 500 to 1000 ppm. (*emphasis added*)

Concerning the trimethyl ammonium hydroxide, Moore, John C. teaches the following:

[0011] The invention employs a high molecular weight and heat stable quaternary ammonium hydroxide (QAH) and, more specifically, **benzyl trimethylammonium hydroxide** (BTMAH), to maintain a strong alkaline environment to cleave the cross-linked polymer of the kind which is typical of a cured negative tone acrylic photoresist, polyimide, liquid crystal polymer, and other similar materials and allow the solvent of the system invention to penetrate, dissolve, and lift reacted material so that it can be rinsed away. The solvent system is composed of a glycol to assist in stabilizing the BTMAH and a cyclic ketone that is ideal for polymer dissolution. Additives also include a stabilizer to terminate internal reactions between BTMAH and the ketone, a blend of triazole-based corrosion inhibitors to protect free copper and aluminum, and a surfactant used to penetrate small geometries and aid in rinsing. Although the QAH compounds are chosen for alkaline saponifying and emulsification of polymers, the BTMAH offers added heat stability and bath life, enabling the product to be

used at elevated temperatures for tenacious polymer coatings. When the BTMAH is combined with the selected solvents and suitable additives, the chemical system becomes an excellent medium for processing microelectronic parts where performance must be maintained for extended periods of time with high loading capacity and where safety and integrity of the substrate and adjacent metal devices must be carefully preserved. (*emphasis added*)

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gregory E. Webb whose telephone number is 571-272-1325. The examiner can normally be reached on 9:00-17:30 (m-f).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Harold Pyon can be reached on 571-272-1498. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

A handwritten signature in black ink, appearing to be 'G. Webb', with a date '1/14/09' written below it.

Gregory E. Webb
Primary Examiner
Art Unit 1796